memo

To: Natelle Dietrich, PSC; Brenda Wilbers, DNR
From: Tom Franks
Date: November 10, 2010
Copy: Fred Coito & Kristina Kelly, KEMA; Gwen Mizell, GSM Development
Subject: Stakeholder questions and comments

This memo contains KEMA's response to four sets of questions and comments, as follows:

- E-mail from Natelle Dietrich dated 11/3/10 referenced as "Email;"
- From the November 4 stakeholder roundtable, provided by PSC staff, referenced as "PSC;"
- Submitted by Natural Resources Defense Council referenced as "NRDC;" and
- Submitted by Renew Missouri, referenced as "RM"

Our responses below are grouped by topic. The questions or comments are in normal font. KEMA's answers are in *italic font*. The questions are numbered as they were received, and the number is prefixed by the reference noted above.

AVOIDED COSTS

Email # 2. $44 mWh avoided energy cost – this number is causing concern as too high. The MISO 13-month average is $32, the **_____ is ___, _____ is ___**. Can you provide additional information/support for $44?

Our economic input files have avoided cost by time-of-use period. In response to the questions about avoided costs we have revised our avoided cost assumptions. The following table shows the revised avoided costs for the first 10 years of the forecast by time-of-use period. We would appreciate and follow any future guidance and direction from the PSC, not just about current avoided costs, but about expected future trends as well.

Year	SON $/kWh	SOFF $/kWh	WON $/kWh	WOFF $/kWh
2011	0.10220	0.03888	0.05897	0.03982
2012	0.10715	0.04046	0.05890	0.04143
2013	0.10915	0.04058	0.05675	0.04108
2014	0.10832	0.04113	0.05629	0.04181
2015	0.11045	0.04125	0.05409	0.04106
2016	0.11337	0.04265	0.05547	0.04255
2017	0.12261	0.04632	0.05924	0.04614
2018	0.13017	0.04749	0.05978	0.04726
2019	0.13485	0.04978	0.06039	0.04866
2020	0.13124	0.05052	0.06246	0.05126

These numbers are higher than what was cited for the most recent period. Note that our base year for the analysis is 2011, and were therefore taken from utility forecasts.

The following paragraph describes the methodology used to derive the values that are currently in the model. The forecasts we reviewed were done one to three years ago, which may account for the discrepancy with the current avoided costs.

Our avoided costs were derived from a review of the data sources in the files provided to us. We reviewed the IRPs for the IOUs to find avoided cost forecasts, and found a number of scenarios in Ameren's IRP, in a chart titled "MRN-NEEM All-hours wholesale electricity prices in Eastern Missouri" (Figure 4, Volume 4 of the IRP). We also found 8760 (hours per year) price forecasts from both Ameren and KCP&L (Ameren's in file NewMidasPrices.csv and KCP&L's in SPPNHourlyPrices-35EP.xls). Because we needed to break out avoided costs by time-of-use period, we turned to these two files. We analyzed the data to estimate cost by year and time-of-use period, then weighted the two forecasts by sales (giving the KCP&L forecast the combined KCP&L and GMO weight) to obtain the forecast used.

PSC #6. Avoided costs - KEMA shows relative flat retail rates; Ameren study shows rates doubling in 10 years. Concern with concept of "relatively flat rates".

The escalation of rates was based on the escalation in our avoided cost forecasts, the sources for which are described above. As noted above, the avoided costs have been revised and this also affected rates. The revised values result in rates that increase 28 percent over 10 years, a slower increase than cited for in the Ameren study. We believe these increases are consistent with the wholesale costs reported in Ameren's IRP.

PSC #18. What is the avoided cost for natural gas utilities? How was it determined? Publicly available or forecasted data? Will there be scenarios for natural gas?

We used gas costs for generation from the electric utilities' IRPs as an estimate of natural gas avoided costs. Specifically, we used data from AllCasesSummary_Oct19_forDoc.xls (Ameren, business-as-usual forecast) and Long Term Forecast (20071116).Table 9 in IRP Report.xls (KCP&L, index base price). Because the two forecasts were very similar, we used a straight (not weighted) average. The following table shows the first 10 years of the gas avoided cost forecast currently in the model.

	Winter	Summer
Year	$/therm	$/therm
2011	0.81609	0.81609
2012	0.78141	0.78141
2013	0.74472	0.74472
2014	0.73646	0.73646
2015	0.72778	0.72778
2016	0.75599	0.75599
2017	0.79200	0.79200
2018	0.80348	0.80348
2019	0.82094	0.82094
2020	0.85197	0.85197

We are planning to do avoided cost scenarios for natural gas for the technical and economic potential estimates. We currently plan to review scenarios with prices 50 percent higher and 20 percent lower that the forecast shown. Please see the response to the comment below for more details on these scenarios.

PSC #19 - KEMA will provide low and high avoided cost scenarios. Please provide the assumptions that shape those findings.

Because of the uncertainty in the avoided cost forecasts, we plan to run the technical and economic potential with avoided costs 50 percent above and 20 percent below the base forecasts or other bounds as directed by the PSC. We believe that these bounds span the range of probable paths for avoided costs and will provide a framework for the PSC and stakeholders to interpret the results of the model with regard to sensitivity to this input. These scenarios are not intended to, by themselves, represent likely paths for avoided costs. They will be provided only to illustrate how the magnitude and direction of avoided costs changes will affect the model results.

RM #1- How is KEMA going to link forecast rate increases to prior IRP modeling which anticipated much more rapid rate increases?

KEMA has linked its forecast rate increases to the increase in avoided costs. The avoided cost forecast is still under discussion, and resolving that issue may resolve this issue as well.

RM #5 - Should current capacity prices and avoided costs, depressed by the capacity "glut", be the values escalated into the future?

The current avoided cost forecast being utilized for DSM Assyst™ is based on utility forecasts through 2026, and only after that applies a straight escalation rate. We believe that the "glut" and its eventual resolution are captured in the forecast.

RM #6 - Do avoided costs include carbon and anticipated environmental compliance costs? How do we reinforce the uncertainty about the level of assumed future avoided costs and retail rates?

The current avoided cost forecast is close to Ameren's "business-as-usual" case and does not assume any additional environmental compliance costs. The high avoided cost scenario is intended act as a proxy for higher avoided cost cases, and to reflect the uncertainty about future avoided costs.

NRDC #8 - The roundtable discussion on November 4th highlighted the considerable uncertainly regarding KEMA's assumed avoided costs. It was suggested that the forecasted rates were much lower that those developed during the IRP process. KEMA's Input report suggests that this uncertainty will be addressed by developing "high" and "low" avoided cost scenarios, but no additional information has been provided to indicate either the values of these avoided costs or the basis for the values. Given KEMA's analytical model, the achievable potential will be heavily driven by the avoided costs. Even a minor underestimate of future retail rates and avoided costs could significantly reduce predicted program participation and savings potential.

Please refer to the discussion above regarding the rate forecast. The purpose of the high and low avoided cost scenario is to illustrate the sensitivity of the results of the model to different avoided costs.

OTHER ECONOMIC INPUTS

PSC #8 - How was the 15% discount rate for residential calculated? 20-year measure life may make sense for refrigerator, but not light bulb. Would like a range for discount rate (high and low incentives, especially for residential).

KEMA has found a wide range of discount rates documented in research literature. We typically use discount rates reflective of long-term purchases, and consistently find a significant difference between the discount rates of utilities and customers. At the PSC's direction, KEMA will apply the

customer discount rate of the PSC's choice to this analysis. Please see the measure input section below for a discussion of the measure life issue.

RM # 4 - Assumed escalation and inflation rates; Do they really reflect rate trends in prior 5 to 10 years? How were these trends estimated in other jurisdictions?

Inflation rates were obtained for each IOU from their IRPs and weighted by sales to obtain a statewide average. If directed, KEMA will apply inflation rates specified by the PSC for this analysis.

PENETRATION RATES

PSC #1 - Ameren presentation— Slide 4

a. Where do KEMA curves come from?

b. Will one be chosen for study -and, if so, which one?

The DSM Assyst™ modeling process adjusts penetration curves as part of the calibration process for the analysis of the achievable potential. The penetration curves used in this portion of the analysis are developed after technical and economic potential are finalized, and as this study has not yet reached this milestone, penetration curves for to be used in this analysis for the state of Missouri are not available for circulation. The curves presented in the Ameren presentation on slide 4 were for demonstration purposes only.

Generally, all measures in the economic potential with a TRC greater than 1.0 are reviewed in the achievable analysis. A TRC greater than one means that the measure-specific economics show the measure to be cost effective – the avoided cost savings outweigh the incremental cost needed for the implementation and installation of the measure. Any measures with a TRC below 1.0 that the PSC directs KEMA to use in the achievable analysis can be included as well. This is sometimes done for measures that will be bundled into a larger program that will be cost effective. Each measure that is selected for analysis in the achievable potential is then assigned a unique penetration curve in KEMA's model. Penetration curves are not assigned at the sector or program level, but rather are assigned at the measure level.

Different curves are utilized for different measures and measure groups to reflect the fact that implementation barriers vary across measures. Using data from the technical and economic potential along with the proposed incentive levels, the model determines a market driving benefit cost ratio. The penetration curve assigned to each individual measure takes into account this market driving benefit cost ratio as well as the assumed barriers that exist for the measure and the measure's starting awareness (a function of the benefit cost ratio without any incentives). A high market driving benefit cost ratio would presume that the measure will be implemented very quickly in the market without any barriers. Therefore, the penetration curves are calibrated to reflect how fast the measure has actually been implemented in past program experience with the relevant barriers the measure faces.

PSC # 13 - Figure 5-3 on page 5.6 of 4/16 KEMA proposal. Also appears in KMA 8/4 Powerpoint presentation. What scientific evidence or study supports this curve? (11/4)

KEMA penetration curves were developed in the 1990's when the DSM Assyst™ model was being developed. At that time they were calibrated to available program data to ensure the curves provided results that were consistent with observed program accomplishments data. They are continually adjusted, for each study where sufficient data is available, in the process of calibrating model results to observed behavior.

Please see the response to PSC #1 for a discussion of the curves presented in the August 4th PowerPoint.

PSC # 14 - Description of penetration curves and how they were derived from other studies.

Please see the responses above.

RM #2 - Do the proposed implementations rate curves for Missouri differ from those used by KEMA for other recent potential studies such as Rhode Island? If so, what is unique about Missouri's situation that necessitates the changes?

Please see the response to PSC # 1 in this section for a discussion of how penetration curves are calibrated for each measure. The penetration curves will be assigned to each measure (or groups of similar measures) based perceived implementation barriers. All curves will be calibrated to prior Missouri program experience as possible.

RM #3 - In KEMA's experience, do customers in jurisdictions with limited prior exposure to energy efficiency programs actually adopt EE measures at a lower rate than national averages over the long term? Is it likely that Missouri customers will persistently have lower long term adoption rates?

To the extent possible, KEMA will review any program data supplied by the PSC to calibrate the penetration curves to be reflective of past program experience in Missouri. Because Missouri customers have had limited prior exposure to energy efficiency programs, KEMA will also review the curves to ensure that the implementation rates of the various measures is reflective of those in jurisdictions with similar experiences. Studies in other jurisdictions have shown that once an energy efficiency program is implemented in a region that has not had prior exposure to a similar program, pent up demand often causes them to quickly become oversubscribed. Large appliance and lighting retailers are also able to quickly adapt to and promote these programs since they already have experience in other jurisdictions that have been promoting energy efficiency. Likewise, a recent study published by JD Power and Associates shows that customers are often more satisfied with their utility if they are offered energy saving programs. A press release of this study can be found at http://businesscenter.jdpower.com/news/pressrelease.aspx?ID=2010168. While implementation experiences will vary across programs, KEMA believes it is likely that Missouri customers will not adopt energy efficiency measures at a significantly lower rate than the

national average over the long term, given that they have adequate access to information and advertising about the programs and measures.

PSC # 7 - National attitudes vs Missouri attitudes - one size fits all analysis for cost/benefit analysis

a. Should we have different curves for residential, commercial, industrial?
b. What decimal is KEMA taking curve?(11/4)

Please see the response to RM #5 above for a discussion on Missouri attitudes and how KEMA will use program data and the response to comment 1 for a discussion on how the penetration curves are defined. Penetration curves are measure specific, not sector specific.

NRDC #1 - Several user-specified parameters are mentioned with respect to the initial level of awareness of all measures, how well information building resources are targeted, et al. How are these factors determined, and how sensitive are the penetrations to changes in these values?

Please see the response to PSC #1 above for a discussion of how these measures are used to determine the penetration curves. The user specified parameters such as incentive levels (percent of incremental cost, often defined as directed by client or from past program review) that affect how the penetration curves are calibrated for each measure. The higher the incentive level for each measure, the higher the market driving cost benefit ratio, and thus the measure will penetrate faster. Other factors that affect the penetration of the measure, such as starting awareness and barriers to implementation are not specified by the user. Starting awareness levels are set using available customer-survey data and other secondary sources. Awareness levels are then built up via program education expenditures and measure economics. (The more cost-effective measures are more likely to have word-of-mouth effects and also get additional 3rd party promotion.)

NRDC #2 - It is indicated that the implementation rate curves can be applied individually by measure and sector (residential, commercial, and industrial). What is the process for selecting these curves for each measure, and how does the data from "major IOU commercial efficiency programs over the past several years" used to calibrate the curves affect the results?

Please see the response to PSC #1 above about how penetration curves are assigned to each measure and the response to RM #3 above for a discussion on how Missouri data will be used in this process.

MEASURE INPUTS

PSC #2 - 20-year normalized life- OK for insulation, but not likely for CFL,

The 20-year normalization process takes into account the actual measure life. Measures that have live less that 20 years are "repurchased" in the model to get to the 20-year life. For example, if a CFL has a 5-year measure life, this measure would be purchased 4 times as part of the normalization process.

a. Is there a replacement consideration - "for free", "inertia"
b. Do you pay incentive each time a bulb is installed?

The model assumes that the customer replaces the efficient equipment with comparable equipment on burnout at their own cost. This is really a function of how the achievable program runs are set up. This is in the next phase of this project. If we modeled a lighting program we would assume there is an incentive for every bulb that was installed as part of a program; there would also be naturally occurring – some of which will be in the program- and some outside the program

PSC #9 - Measures inputs - Did KEMA consider commissioning and retro-monitoring? (Omaha Continuous Commissioning)

The KEMA measure list includes measures that could be bundled as part of a commissioning effort. Examples of these measures are lighting control tune-ups and EMS optimization.

PSC #12 - What is savings measures data?

Measure savings data is fully documented in the input files provided on October 27. KEMA will change any input as directed by the PSC.

PSC #16 - How does KEMA account for renewed costs and on-going O&M?

If a program-induced measure reaches the end of its useful life in the planning period, it is assumed the customer will repurchase this measure without additional program funding. Ongoing O&M that is different between the measure and the base technology can be captured by estimating the net present value of the additional O&M costs and adding it to (or subtracting it from if there are cost savings) the measure cost.

PSC #17 - How does KEMA calculation net-to-gross risk, net-to-gross values?(11/4)

The DSM Assyst™ model is used to develop estimates of naturally occurring energy efficiency and energy efficiency resulting from program effects. These estimates can be used to develop net-to-gross ratio (NTGR) estimates:

NTGR= (net program savings) / ((net program savings)+(naturally occurring savings))

Net-to-gross risk is a factor used in the consideration of program operation and/or cost recovery, and not an input used in our potential model.

NRDC #4 - KEMA's methodology description and Measure Inputs do not make it clear if and how early-retirement retrofit opportunities (i.e. replacing a piece of inefficient equipment before the end of its useful life) are being considered in the analysis. It is our opinion - as supported by numerous studies in other jurisdictions - that neglecting retrofit opportunities in the analysis will significantly underestimate program potential. Additional clarification is needed to address how KEMA proposes to analyze retrofit measures and how baseline assumptions, costs, savings, and effective useful measure lives differ between replace-on-burnout and retrofit measures.(NRDC)

The measure input files contain provisions for "early-retirement retrofit opportunities" for residential electric measures including central air conditioning, room air conditioners, refrigerators, freezers, and water heaters. KEMA estimates the baseline of these measures based on the assumed age of equipment that will be eligible for the early replacement program. The overall savings percent is a weighted percent based off of the savings between the currently installed measure and the efficient equipment for the installed measure's remaining useful lifetime and the savings between the current baseline and the efficient equipment for the remainder of the replacement measure's lifetime. Since the measure is being installed before the current equipment would have failed, the cost for the new equipment is calculated using the net present value of purchasing that measure today instead of at failure. In addition, commercial lighting retrofits are considered as these are fairly common.

Likewise, DSM Assyst™ models early replacement separately from" replace on burn-out" to reflect actual market behavior. In the achievable potential analysis all retrofit and replace on burnout measures are modeled in separate programs to again more accurately reflect actual market behavior.

NRDC #5 - How is eligible stock determined for retrofit vs. replace-on-burnout measures? In other words, when is a retrofit opportunity possible in the model? The methodology text suggests that it is a function of "capital equipment turnover rates", but this is typically only applicable to lost-opportunity measures.

Retrofit opportunities are available in the model starting in Year 1. They remain available until the opportunity is converted via the program or through naturally occurring customer action. There is a toggle in the model's input files that indicate if a measure is retrofit (noted as a 1-time replacement or replace-on-burnout – ROB).

NRDC #6 - How were the "Energy Savings (percent)" presented in the various Measure Inputs spreadsheets correlated to the "Base Technology EUIs"? Were measure savings estimates developed specifically for Missouri or based on previous analyses?

DSM Assyst™ uses ratio (i.e. percentage) savings instead of absolute (i.e. kWh) savings. Energy savings represented in this fashion need not be correlated to the specific baseline once developed as it is assumed they will save the same percentage over the base equipment regardless of the amount of consumption. For example, a 15 watt CFL will always save 75% of the energy used by a 60 watt incandescent regardless of the final baseline. If a different piece of base equipment was

used in this case (say a 75 watt incandescent), the savings percent would be updated to reflect that change.

Some measures however must be updated in each study to more accurately reflect the climate of the jurisdiction. A considerable effort was given to update all savings to be Missouri specific, especially those that have high savings potential, are climate dependent, or have base equipment that is different from what was used in past studies. Documentation for many of these measures can be found in the measure input files from the October 27 deliverable.

NRDC #7 - It is clear that the "Energy Savings (percent)" values were derived from a number of difference sources. While we were not able to fully review all measure characterizations, it appears that some of the data sources assume different baselines than those used in the analyses. For example, it appears that Measure #152 "Ceramic Metal Halide" assumes 56% savings over Measure #150 "Base Incandescent Flood, 75W to Hardwired CFL", the assumed baseline. However, the source document, ACEEE, 2004, Emerging Technologies & Practices, assumes a baseline 100W Halogen-IR PAR lamp to derive the 56% savings estimate.

KEMA will review and correct the input files as appropriate.

BASELINE & BUILDING INPUTS

Email #3 - Line loss numbers – Is there a reason you calculated one line loss for all sectors as an average for residential, commercial and industrial instead of calculating an average line loss for each individual sector?

KEMA will calculate line losses by sector based on the available information and calibrated with reference to the information supplied by Ameren. We note that due to the nature of cooperative service territories, their line losses may be higher. However, as noted in response to question # 5 in the process and modeling section from the roundtable discussion, the cooperatives have not provided sufficient data to further refine this input.

PSC #10 - Costs, savings, applicability, saturation -Are residential surveys from Indiana, Rhode Island, Colorado appropriate for MO. For instance, refrigerator replacement in dense state like Rhode Island would not be the same as a refrigerator replacement program in urban MO or rural cooperative MO.

KEMA developed measure cost, savings, applicability and saturation inputs based on a variety of factors including the residential surveys from the states reference, the 2006 "Missouri Statewide Residential Lighting and Appliance Efficiency Saturation Study by RLW Analytics, and the Ameren/Global study.

PSC #20 - Baseline inputs - What and where are the assumptions supporting the baseline? What are the variables that were considered?

KEMA's description of baseline inputs is available in two documents, as follows:

October 4, 2010 "Interim Memo on Baseline Data" at
http://psc.mo.gov/electric/BaselinePrelimMemo101004.pdf

and

October 27,2010 "Input Report," Section 4, at
http://psc.mo.gov/electric/MissouriInputsReport2010.pdf

PSC #21 - Weighted average IOU, cooperative loads — Why did KEMA use national numbers when it appears MO data is available?

KEMA used the best data source available to develop average loads. All baseline loads were calibrated to Missouri usage totals. KEMA will change these input as directed by the PSC.

PROCESS AND MODELING

Email #1 - Files are hard coded, which makes sense since the underlying data is confidential. Since we can see confidential data, is it possible to see the underlying files, or get an explanation of how the numbers were calculated and weighted (i.e., what you did to the Ameren and KCPL component to arrive at your data)?

The October 27th report describes the approaches used for weighting and estimating inputs in the absence of specific data. KEMA will follow PSC direction as to the weighting or calibration of any specific or set of inputs.

PSC #3 - Will the achievable potentials have cost estimates around the program measures? (How much will it cost to deliver?)

Incremental measure costs and incentive costs are calculated at the measure level and are available as model outputs. Additional program costs (such as marketing and administration) are determined at an aggregate level and are not shared back to the measure level. In aggregate, all costs associated with delivering the program measures are captured.

PSC #4 - Where and how will KEMA obtain utility program costs?

In response to two rounds of data request to all utilities and additional requests to targeted utilities, KEMA has not received sufficient program input and output data to determine the basic metrics for all programs across all utilities. If the PSC directs, we will prepare an additional data request specifying the desirable data points. This would include administrative costs, marketing/advertising costs, incentives (both as a total dollar value and as a percent of incremental cost), participation rates (both as an absolute number and as a percent of the eligible

market), and kWh or therm savings. The information garnered from this effort will be used, to the extent justified by its breadth and depth, to calibrate the penetration curves for Missouri.

PSC #5 - Where and how will KEMA obtain cooperative and municipal data?

KEMA's sub-contractor GSM Development has undertaken a focused effort to collect cooperative and municipal data. The data that was voluntarily provided by these constituencies generally falls in to the following categories: 1) not required for the model; 2) not sufficiently detailed to add value to the inputs; and/or 3) not sufficiently disaggregated to add value to the inputs. GSM had begun primary research on the inputs required by the model by direct contact with individual cooperatives. This effort ceased upon notice from Brent Stewart of AMEC that all data would be funneled through his office, as noted in a memo copied to Natelle Dietrich on October 12, 2010.

With regard to the municipal data collection, GSM Development was able to acquire partial baseline information from Columbia Water and Light, Independence Power and Light, and City Utilities of Springfield.

PSC #11 - Is Missouri aligned with average of other states used in study?

Many of the inputs used in the analysis are similar or roughly comparable regardless of geographic location. For example, manufacturer's suggested retail price (MSRP) is readily available and uniform across the nation. Where Missouri-specific data were available, reliable, and representative of the state as whole, we have used it to scale the inputs as appropriate.

PSC #15. -How does KEMA study account for fact that under SB 376 statute, industrials can exempt out. (Commissioner asked before and response never received.)

This issue applies only to the estimate of achievable potential. Whether a customer determines to "exempt out" of program participation has no impact on the technical and economic potential of a particular measure or suite of measures. We suggest that the achievable potential include savings from all of the customers whether or not they may chose to "exempt out." We would then note in the report that a portion of the savings for the industrial sector, as specified by the PSC, may not be achieved due to this clause. Alternatively, we could exclude a PSC-determined portion of the industrial sector from any potential savings if so directed by the PSC. This portion would be best provided in relative terms, e.g. percent of floor space or load.

PSC #22 - What was KEMA's relationship between KW and kWh for balancing?(11/4)

KEMA will estimate the potential for demand response savings as specified in the proposal "To estimate demand response potentials, we will review impacts from the Federal Energy Regulatory Commission's (FERC's) 2009 National Assessment of Demand Response Potential for the state of

Missouri and make appropriate adjustments to reflect any updates to data that we might [find] during our data development phase of the project."

In estimating energy efficiency potential, peak demand savings are associated with each measure. Peak demands are estimated for each measure by applying measure/building-type load shapes to annual energy usage estimates. Measure peak savings are developed by applying the savings percents to the peak demand estimates. Adjustments are made when appropriate to address measure savings that do not follow load.